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Science News-Letter

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PHYSICS—GEOLOGY

Fabulous Fortunes at Earth's Center?

Old Mother Earth has a heavy heart.

But for all that it may be a heart of gold.

Geologists now tell us that instead of living on a thin crust of rock and earth, floating like slag on a sea of seething lava and molten rock, as we were taught a generation ago, we are living on the outer weathered crust of a globe as rigid as steel and heavier than any of the common rocks.

It is hot enough inside, geologists tell us, so hot that probably all the rocks are melted, but the pressures are so enormous that this molten rock behaves in many ways almost as if it were solid metal. It is now thought that the great bulk of the interior of the earth, all of it to within 1,800 miles of the surface, is a mass of heavy metal, principally if not wholly iron, or iron and nickel. So that Mother Earth has a heart of iron, heavy but strong.

Yet it may not all be common metal, such as iron or nickel. There are metals heavier than these, and rarer. If the core of the earth be conceived as a mass of melted metals, the heavier would tend to collect at the center, and among these heavy metals that are rare at the earth's surface are gold and platinum. So, some geologists have surmised that the center of the earth may be a huge nugget of incalculable value.

"Bosh," say other conservative scientists. "Sensational humbug, fit only for half-wits. Nobody knows that the gold is there, and if it is there it is probably mixed or combined with other substances and, anyway, it would be impossible to get it out.

"Don't quote me as saying there's a gold mine at the center of the earth," said one eminent authority on the earth's insides. "If you did, there are a lot of fools that would be writing to me and asking how it would be possible to get at it."

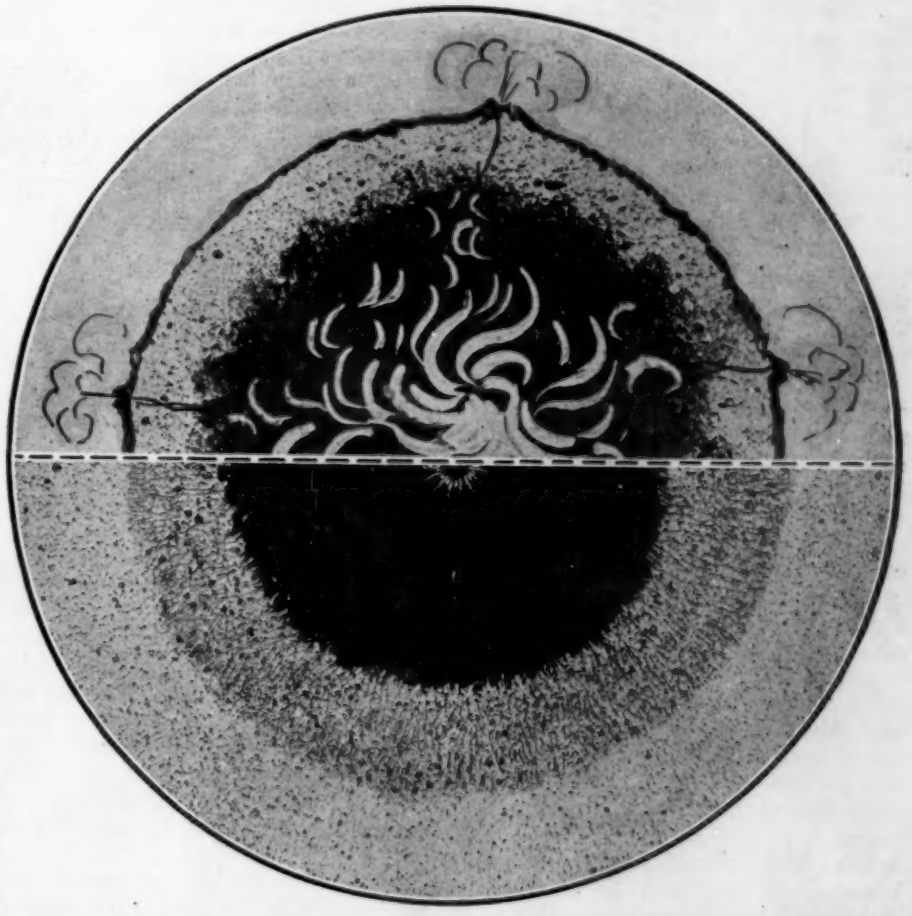
But the fact remains that not a few competent authorities think there is fair reason for supposing that for a short distance around the very center of the earth there may be amounts of the heavy metals, such as gold, lead, silver and platinum, not necessarily in the pure state, but there nevertheless.

It is only a guess, or what the scientists more elegantly and exactly call a hypothesis, but it has something more than guesswork behind it.

What do we know of the inside of the earth anyway, and how do we know it?

When the nebular hypothesis of the origin of our solar system held sway, about 50 years ago, it was believed by scientists that all the inside of the earth below a depth of about 10 or 20 miles was liquid rock, like the lava that flows from volcanoes. Volcanoes themselves were thought to be safety valves for the superheated boiler inside, so that when the pressure got

(*Just turn the page*)



Upper—THE EARTH was once thought to be liquid rocks under pressure with volcanoes as safety valves. This theory has now been exploded. Lower—THE EARTH'S interior is now believed to be made of heavy rock and metal, with perhaps a huge nugget of gold and platinum at the center.

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Gold at Earth's Center?

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too great they popped off and maybe killed some tens of thousands of people in so doing, but saved the whole world, or at least large sections of it from blowing into fragments. The crust of the earth was thought to be just a sort of scum on the surface of the liquid.

But investigation developed facts that did not square with this theory a bit.

For example, the attraction of the moon and the sun on the waters of the ocean produces the tides; and if the interior of the earth were a rather thin liquid, the same pull of the moon and sun would raise tides there, speedily raising havoc with the exterior landscape. Furthermore, it has been found that earthquake waves travel through the inside of the earth in just about the same way and at the same speeds that they would through a solid sphere of highly tempered steel.

Evidently, then, the inside of the earth is made of something very tough and very rigid. Have we any clues as to what it might be? We have two fairly good ones. Take the weight of the earth, for example.

A competent physicist or astronomer, with the proper instruments, can weigh the earth, if not quite as accurately as the grocer weighs out a pound of butter, yet with sufficient accuracy for all practical purposes.

Sir Isaac Newton pointed out the way when he discovered the laws of gravitation. This depends on just two factors—the mass of the two or more bodies involved and their distances from one another. If the distances and gravitational pull are known, the mass can be calculated, and for all earthly purposes mass and weight amount to the same thing.

The density of the earth has been measured and found to be just 5.52 times that of water. But here is an odd thing: Taking everything on the surface of the earth, including the waters or the seas; adding to all this the rocks as far down as we know anything about them, or a matter of a few miles, and lumping it all together we find the average density to be only 2.8 times that of water, or about half the density of the earth as a whole. If the surface of the earth is so much lighter than the earth as a whole, evidently there must be something rather heavy as we get toward the center. We have already seen that it must be rigid. The qualities seem to be approaching those of a metal.

Here is another clue: Everybody has seen meteors, or "shooting stars." A few people have seen what the biggest of them really are after they have fallen to earth—irregular, pitted masses, the surface fused from the intense heat generated by their rapid fall through our atmosphere. What are they?

They are thought to be fragments either of a planet like our earth which was disrupted by some immense catastrophe or, more probably, fragments of the parent substance of which our solar system and all the planets are made. Either way, these meteorites are good clues as to what our own earth is made of.

We find there are, in general, two kinds of them. One resembles in composition the deeper rocks of the earth's crust as we know it; the other kind is made of metal. This metal is iron mixed with nickel and cobalt and a few other metals in very small amounts. These metallic meteorites are more numerous than the stony sort. Hence it is thought likely that the earth is composed in part of rock, but mostly of iron or nickel-iron. In what proportion are these substances divided in the earth's insides?

That is a question which modern geologists have made much progress toward answering. They have done it by a study of the time it takes

(*Turn to page* 197)

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INVENTION

Rubber Shoes For Horses

"Rubber tired" mules have joined the fast-moving parade of American rubber achievement. In really exclusive mule circles, discriminating animals regularly wear rubber shoes and hoof pads.

Not to be outdone by his stubborn half-brother, the well bred horse now cavorts in stylish fashion in ready-to-wear shoes, according to scientists of the U. S. Department of Agriculture.

The ready-to-wear idea for horses was encouraged by the passing of the blacksmith shop and the consequent difficulty of the farmer in getting his horses shod. Regular equine shoe sizes are readily obtainable.

The use of rubber shoes and rubber hoof pads is becoming general because these protectives have been found helpful when horses and mules must work on hard surfaced streets and highways. The new styles relieve sore and lame feet and often prevent corns and other foot ailments.

Rubber shoes prevent slipping on certain treacherous surfaces, thus reducing to a minimum the number of horse injuries due to falling. Hoof pads and rubber shoes, the department advises, should be used as a protective, rather than as a cure for the many ailments caused by the constant driving of horses and mules on hard surfaced roads.

Rubber pads are not recommended for farm horses, because the soil works its way under the pad, causing lameness by extra pressure in the navicular joint. Where rubber pads are used, pine tar with a thin layer of oakum should be applied to the sole to keep it moist and prevent contraction.

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ENGINEERING

Auto Crankshafts Honed

Automobile crankshafts are now honed, much like a razor, in order to make them smooth and true. L. A. Becker, Cleveland engineer, has reported to the Society of Automotive Engineers, how honing the shafts with abrasive stones is replacing the grinding and polishing with emery usually practiced. Automobiles will not take so long to break in since honing will allow smaller clearances, eliminate initial wear and reduce oil dilution, he declared.

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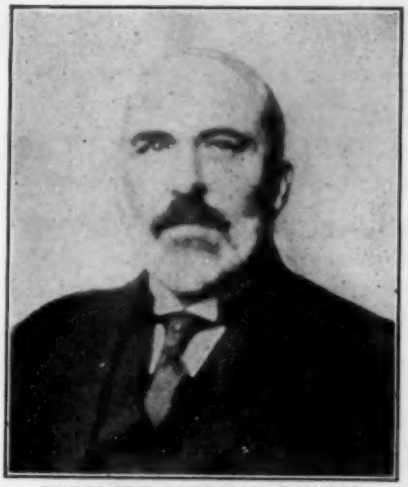
ORNITHOLOGY



THEODORE SHERMAN PALMER

Aigrette Exterminator

The fact that America's birds and game animals are now on the road to increase rather than extermination is probably due as much to Dr. Theodore S. Palmer as to any other one man. The aigrette, robbed from the snowy heron during the nesting season to be the pride of chapeau and coiffeur a generation back, was suppressed as an article of commerce largely through the efforts of this ornithologist.

He has had a large part in forming the Federal laws and the treaty with Canada for the protection of migrating birds and in instigating the establishment of bird refuges throughout the United States. He is author of one of the standard works on the classification of the fauna of North America. One of his achievements, that ranks high in the estimation of fellow biologists and bird lovers, is his share in keeping the mongoose out of the country. Many attempts have been made to import this weasel-like little animal on account of its predilection for a diet of snakes. Unfortunately it kills everything in its way up to two or three times its size, including all ground nesting birds and rabbits. So Dr. Palmer has held up the immigration bars against the mongoose.

Dr. Palmer is a rara avis himself, a bona fide native son of the Golden State. He was born in Oakland in 1868. He finished his undergraduate work at the University of California in 1888 and received the degree of M.D. at Georgetown University in 1895. Since 1890 he has been associated with the U. S. Biological Survey in the capacities of ornithologist and game conservation expert.

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BOTANY

Prizes For Honey Locusts

Fodder for stock will be harvested from the farmer's fencerow and woodlot trees, as well as timber for posts and other uses, according to a plan now being promoted by the *Journal of Heredity*, of Washington, D. C. Honey locust pods are eaten eagerly by hogs and cattle, which find them very tasty and nutritious, and $50 in prizes are offered for the tree with the biggest and best yield of pods. They invite anyone who owns an exceptional locust tree to write them for particulars of the competition.

Some of the elongated fruits of the honey locust tree are a foot or more from tip to tip, and the small, hard seeds are embedded in a matrix of sweet, gelatinous substance. The pods are somewhat similar to those of the carob of the eastern Mediterranean countries, which has been used for centuries as stock food in its native land and is planted to some extent in our own Southwest. The carob will even do, at a pinch, for human food. When the Prodigal Son found himself reduced to "the husks that the swine did eat," it was these thick, sweetish carob pods he was eating; and under the name of "St. Johns bread" they are regarded by some as having been the frugal diet of John the Baptist.

Some experiments already in progress indicate that the native honey locust may be a fair competitor for the carob as a fodder producer.

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ENTOMOLOGY

Beetle Dangerous to Corn

Entomologists are viewing with alarm the latest addition to the bill of fare of the Japanese beetle, that has been committing serious depredations in eastern states for the past few years.

When Dr. A. L. Quaintance, associate chief of the U. S. Bureau of Entomology, accompanied by several fellow scientists, visited the headquarters of the Japanese beetle warfare at Riverton, N. J., recently, the pests, in addition to denuding orchards of fruit and leaves alike, were feeding busily on the silk of young sweet corn.

This type of injury, scientists fear, may indicate serious damage to the country's corn crop if the pest can not be headed off from the corn belt of the middle west.

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To keep healthy fish require vitamins in their food.

For the Biologist—

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Gold at Earth's Center?

(*Continued from page* 194)

earthquake waves to go around the surface and through the inside of the earth, much as sound waves do through the air, and the rate they travel depends on the substance they are traveling through. The denser, the faster.

Every time there is an earthquake there are two sorts of waves sent out through the earth. One travels around on the surface; the other takes a short cut through the inside, and if the point of origin and the point of final observation are both known, the path of the waves may be calculated through the earth and just how deep they went at the deepest. Then from their speed a calculation may be made as to the density of the interior.

From all these and other considerations it has been found that the earth probably exists as three principal layers, something like the skin, the meat and the pit of a peach. What we know as the outer crust is the skin. It probably extends to a depth of about 35 miles. Below this the meat of the fruit corresponds to a thick layer of rocks of somewhat different chemical composition from those on the earth's surface and resembling more that of the stony sort of meteorite. This layer extends downwards for about 1,800 miles. Then we come to the pit of the fruit, an inner metallic core some 4,400 miles in diameter, and from inferred observations of its density and properties, of about the density of iron or nickel-iron, although much more rigid. Unlike the fruit, these layers are thought to blend gradually with each other.

The question still more undecided is whether the inner pit, to complete the analogy, has a kernel of gold and other heavy metals right around the inner core. It is quite a safe question to guess about, for with the instruments at hand nobody can ever find out, and if they were to find the earth had a golden center, nobody could ever get the gold out.

The earth is a little more than 7,900 miles through at the equator, a few miles less at the poles, so that from any part of the surface to the center it is close to 4,000 miles. A tunnel that long through the outer crust of the earth would be a huge undertaking. To the center of the earth it would be an impossible one.

To begin with, before two miles deep was reached it would have become impossibly hot. The rocks in the lowest levels of the San Juan Del Rey mine, in Brazil, the deepest mine in the world, have a temperature of 117 degrees at a level of about a mile beneath the surface. The rate of increase varies in different parts of the earth, but averages about 50 degrees Fahrenheit for every mile of depth. At that rate the temperature at a depth of 50 miles would melt all the rocks.

Then there is the pressure existing at these great depths. At the center of the earth it is calculated to amount to 25,000 tons to the square inch, and long before that depth is attained it is so terrific that no sort of construction could withstand it.

So it looks as if we should have to remain in ignorance some time yet of just what is at the center of the earth.

There is, however, a possibility that we may some day find out what is in the center of the earth without the bother of attempting the impossible and trying to perform an explanatory operation. Science is just really beginning to learn the trick of seeing through things with invisible rays. The art is young.

Fifty years ago it would have been thought impossible that we could see the safety pin after the baby swallowed it. Now, by means of the X-ray, it is as commonplace as for babies to swallow pins. Perhaps in another 50 years we may be able to see the gold nugget Mother Earth swallowed when she was but an infant.

One interesting fact does appear, however, that confirms the opinions of many travelers in Europe. The Old World is sitting on a hotter part of the earth's crust than the New. Whereas, in central and western Europe the temperature rises one degree centigrade for every 32 meters of depth, it is necessary to go down 42 meters in most of America to get the same rise of temperature. Europe seems to be nearer the internal fires. Comments are superfluous.

How did the earth get that way? What makes it hot? How was it made?

Science used to say that all of what is now the space occupied by the solar system was once a vast nebula, a mass of exceedingly rare gases. It began to condense. So doing, it got hotter and hotter. It began to revolve as it condensed. As it revolved, a central core was formed. This became the sun, which was vastly larger than it is now. As it revolved it threw off masses of material which condensed to form planets. These in turn revolved, threw off satellites and condensed into solid bodies, or bodies

(*Just turn the page*)

BOTANY

Mexico's Giant Tree

Greater perhaps than any other single growing thing and reigning queen of the vegetable kingdom is a giant cypress tree in Santa Maria de Tule near Oaxaca in southern Mexico.

The tree is so old that it is the subject of many semi-religious myths, but it blooms vigorously every spring and drops its seeds in the fall. Hernando Cortez described it in a letter to his king 400 years ago, and Baron Humboldt in his famous scientific travels through Mexico in 1803 visited the famous cypress and is accused of having carved his name and sentiments on its bark.

Its great size has struck many with awe, and one colonial history claims it is 6,000 years old, or as old as the Flood, but Professor Conzatti of the Mexican Ministry of Education made a scientific study of the tree and its physical surroundings and gave it 2,000 years. This would make it a contemporary of Christ and of the famous Maya civilization which flourished there many centuries ago. The ancient Maya ruins of Mitla are but a few miles away.

The giant sabino or ahuehuete, as the tree is called in Oaxaca, rises to a height of 140 feet and has a trunk 110 feet around. Its top branches stretch 200 feet across, and its trunk is knotted and gnarled from age. The bark is cracked and rough, and roots stick out of the ground like elbows.

The tree is a close relative of the cypress of Florida and Louisiana, and like that member of the family, it requires a great deal of water. But the giant tree of Santa Maria is nearly a third of a mile from the nearest river, and even that is very low in the dry season. But Professor Conzatti solved the mystery of the water supply and found that the tree tapped the same water-bearing strata of earth five to eight feet under the ground that the villagers of Santa Maria did with their wells. Two other sabinos, believed to be child and grandchild of the great mother tree, grow nearby, and would be considered giants themselves if they stood alone. By measuring the rate of growth of other cypresses in the vicinity and studying certain of their characteristics, Prof. Conzatti was able to form an estimate of the age of this colossal tree.

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Gold at Earth's Center?

(*Continued from page* 197)

with a solid crust and molten interior as our earth was conceived to be under this, the nebular hypothesis, first promulgated about a hundred years ago.

The new theory, the "planetesimal" theory, starts with the sun, a mighty orb much larger than that of today. Some time in the abyss of the past another star approached it. Its attraction was so strong that tidal action was set up in the sun, its crust was broken and vast masses of gaseous matter issued with frightful velocities and to incredible distances. This matter cooled into relatively small chunks of solid matter, such as meteorites are. They coalesced to form planets and satellites. In so doing they also heated up to a great degree, but essentially they built the earth on a solid, not a liquid foundation. Volcanoes, according to this latest theory, are merely local boils on Mother Earth's complexion, and are not a constitutional complaint.

By this theory it is relatively easy to account for the heavy metallic core of the earth, for it was there to start with and grew by gravity. A spectroscopic study of the sun shows few heavy metals in its outer atmosphere. Presumably, the subsiding process has already begun there.

And so, Mother Earth has a hard, heavy heart. As for a golden one? What says a conservative scientist, such, for example, as Dr. Henry S. Washington, volcano specialist of the Geophysical Laboratory of the Carnegie Institution of Washington? In cold type he declares:

"We may conclude that the metallagenic elements (those of the heavy metals) are rare on the earth's surface and do not show intense spectrum lines on the sun because they are too deeply buried in both. One might recall, to pass from science to fiction, that the idea was, in a way, foreshadowed by Jules Verne, who in one of his stories describes a comet or meteorite composed of telluride of gold."

The fancies of Jules Verne have so many of them come true that one hesitates to scoff. Perhaps in spite of all her manifold infirmities and distresses, Old Mother Earth still has a heart of gold.

Science News-Letter, September 24, 1927

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Venus Now Visible in Daylight

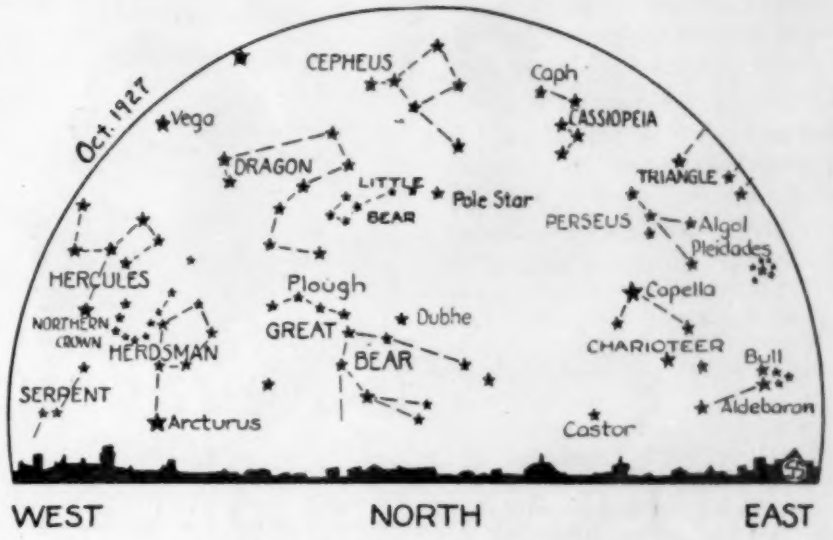
By James Stokley

Look for Venus in the daytime! Ordinarily, the only astronomical body that we are privileged to observe during daylight is the nearest of all the stars, the sun. Sometimes, when the moon is near first or last quarter we see it, in the former case in the afternoon, in the latter in the morning.

But to these two this month is added the planet Venus. Brightest of all the planets when at its climax, the brilliancy of Venus next month is inferior only to the sun and moon. On October 17, it attains its greatest magnitude, and for perhaps a week or more either side of that date it will be easily visible in the morning sky, if you know where to look for it.

One way of finding it in the daytime would be to get up before sunrise. Then it will be blazing in the east, and there will be no doubt of its identity. By watching it carefully until the sun rises, you can easily see it in daylight. But a simpler method, and one not requiring such early rising, is to use the celestial guide, the moon, on October 21.

On that date the moon and Venus are in conjunction. That means that they will be as close together as they will get on this particular circuit of the moon around its orbit. At 8:00 a. m., eastern standard time, Venus will be about seven and a half degrees south of the moon. The moon itself is about half a degree in diameter, so if you find the moon in the south on the morning of the twenty-first, and then look about fifteen times its diameter to the south, there you will see Venus. On the 15th of the month, Venus will be directly south at 9:17 a. m., local time, so that will also help you to find it.



Jupiter Also Visible

Jupiter, largest of the planets, is also visible this month, but in the evening sky, as it has been for many weeks. It is directly south about ten o'clock. If one were to watch it night by night, as it moves among the stars, and note its position carefully, a peculiar feature of its motion would be apparent. Jupiter, like all the planets, moves around the sun from west to east. But this month it seems to move from east to west. It is in the constellation of Pisces, the fishes, and at the end of the month it will be about three and a half degrees to the west of its position at the beginning of the month. Yet a few months ago, it could have been seen moving from west to east, and in November it will seem to turn around and start moving east again.

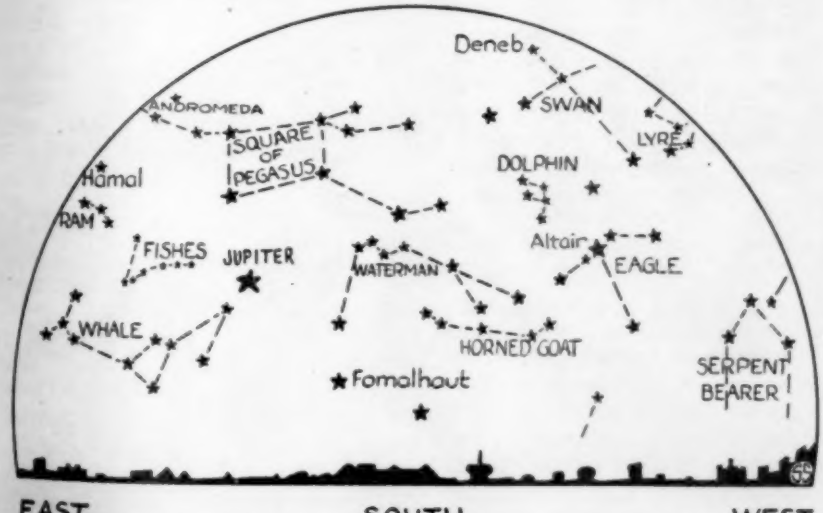
How is this? Four centuries ago, as for two thousand years previously, it was interpreted as an actual change in the motion of the planet. According to the Ptolemaic theory, which was then universally accepted, Jupiter moved in a small circle. This was called the epicycle, and its center moved in a large circle around the earth. Though the motion of the center of the epicycle was always from west to east, the motion of the planet itself was sometimes in the opposite direction.

Explained By Copernicus

In 1543, with the publication of the theory of Copernicus that the sun was at the center of the solar system, and that the earth, like the other planets, revolved around it, a new explanation was offered. This is the one which we now know to be true.

Copernicus showed that we do not observe Jupiter from a stationary object. The earth moves, and we move with it. The combination of the motion of the earth and the motion of Jupiter is to be blamed for the backsliding of that orb. Anyone who has been on a train in a station when another came in on the adjoining track can appreciate the situation.

The case with Jupiter is the same. This month Jupiter, as always, is moving from west to east. So is the earth. But we are moving faster than Jupiter, and so we leave it behind. We are not aware of the motion of the earth and so the effect is that Jupiter moves backwards.



Hold these maps in front of you and face north or south. They will then show stars as they appear to you in the sky.

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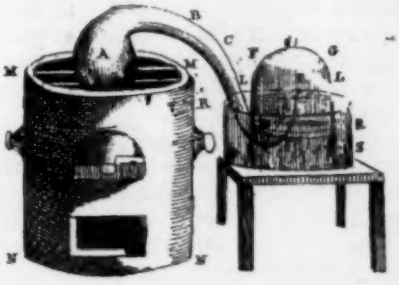
Classics of Science: Composition of The Atmosphere

LAVOISIER as he appears in the procession of great scientists that adorns the face of the building of the National Academy of Science in Washington.



An engraving made by Mme. Lavoisier to illustrate the experiment reprinted below.

LAVOISIER: ELEMENTS OF CHEMISTRY. Translated from the French by Robert Kerr, 1790.

ANALYSIS AND SYNTHESIS OF RED OXIDE OF MERCURY. SEPARATION OF OXYGEN FROM AIR, AND ITS RECOVERY.

You can, if you wish, repeat Lavoisier's experiment on the constitution of air with apparatus found in any school laboratory. For his matrass use a flask connected with glass tubing. The second part of this experiment is found in most elementary chemistry textbooks.

I took a matrass of about 36 cubical inches capacity, having a long neck BCDE, of six or seven lines internal diameter, and having bent the neck so as to allow of its being placed in the furnace MMNN, in such a manner that the extremity of its neck E might be inserted under a bell-glass FG, placed in a trough of quicksilver RRSS; I introduced four ounces of pure mercury into the matrass, and, by means of a syphon, exhausted the air in the receiver FG, so as to raise the quicksilver to LL, and I carefully marked the height at which it stood by pasting on a slip of paper. Having accurately noted the height of the thermometer and barometer, I lighted a fire in the furnace MMNN, which I kept up almost continually during twelve days, so as to keep the quicksilver always almost at its boiling point. Nothing remarkable took place during the first day: The Mercury, though not boiling, was continually evaporating, and covered the interior surface of the vessels with small drops, at first very minute, which gradually augmenting to a sufficient size, fell back into the mass at the bottom of the vessel. On the second day, small red particles began to appear on the surface of the mercury which, during the four or five following days, gradually increased in size and number; after which they ceased to increase in either respect. At the end of twelve days, feeling that the calcination of the mercury did not at all increase, I extinguished the fire, and allowed the vessels to cool. The bulk of air in the body and neck of the matrass, and in the bell-glass, reduced to a medium of 28 inches of the barometer and 10° Reaumeur (54.5° Fahrenheit) of the thermometer, at the commencement of the experiment was about 50 cubical inches. At the end of the experiment the remaining air, reduced to the same medium pressure and temperature, was only between 42 and 43 cubical inches; consequently, it had lost about 1/6 of its bulk. Afterwards, having collected all the red particles, formed during the experiment, from the running mercury in which they floated, I found these to amount to 45 grains.

I was obliged to repeat this experiment several times, as it is difficult in one experiment both to preserve the whole air upon which we operate and to collect the whole of the red particles, or calx of mercury, which is formed during the calcination. It will often happen in the sequel, that I shall, in this manner give, in one detail the results of two or three experiments of the same nature.

(*Just turn the page*)

Starvation for Epilepsy

Will a starvation diet cure epilepsy, one of man's most ancient diseases?

Acting upon the observation that epileptics deprived of food had fewer "fits," a group of specialists in children's diseases, Drs. F. B. Talbot, K. M. Metcalf, and Margaret E. Moriarty of the Massachusetts General Hospital set out to analyze the condition of starvation that brought about the favorable reaction. This done they proceeded to work out a diet that would reproduce these conditions and yet provide nourishment so their patients would not die from starving.

Their results have been so successful that they feel justified in making the statement that this method of treatment gives the greatest promise of improvement of any yet devised for the treatment of epilepsy in childhood.

The condition brought about by starving that seems to be unfavorable for epileptic seizures is known as ketosis and can be produced by feeding a diet high in fat but low in carbohydrate and protein. The investigators found that among other changes resulting from fasting were an increase in the amount of uric acid in the blood, a lowering in the amount of sugar, and a more pronounced acid reaction of the blood. The epileptic children treated with diets that produced changes like these showed marked decrease in the number of attacks.

Dr. M. G. Peterman, of Milwaukee, Wisconsin, has been following out practically the same program in treating epileptic children and has just reported to the American Medical Association his results with fourteen cases of several years' standing. These children have completed their diet treatment and are now on normal food and have been free from the attacks from six months to three years since they have resumed eating regular food like the rest of the family.

Science News-Letter, September 24, 1927

Diagnosis Revised

Quotation from "Brighter Biochemistry" published by the Biochemical Laboratory, Cambridge University.

Jack Sprat could eat no fat,
His wife could eat no lean.
Rickets and scurvy were their fates,
From lack of vitamin.

Science News-Letter, September 24, 1927

News-Letter Features

Born over five years ago of the demand and interest of those individuals who had caught a glimpse of *Science Service's* news reports to newspapers, the SCIENCE NEWS-LETTER has since proved interesting to laymen, scientists, students, teachers and children.

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Composition of the Atmosphere

(*Continued from page* 201)

The air which remained after the calcination of the mercury in this experiment, and which was reduced to 5/6 of its former bulk, was no longer fit either for respiration or for combustion; animals being introduced into it were suffocated in a few seconds, and when a taper was plunged into it, it was extinguished as if it had been immersed into water.

In the next place, I took the 45 grains of red matter formed during this experiment, which I put into a small glass retort, having a proper apparatus for receiving such liquid, or gaseous product, as might be extracted: Having applied a fire to the retort in a furnace, I observed that, in proportion as the red matter became heated, the intensity of its colour augmented. When the retort was almost red hot, the red matter began gradually to decrease in bulk, and in a few minutes after it disappeared altogether; at the same time 41½ grains of running mercury were collected in the recipient, and 7 or 8 cubical inches of elastic fluid, greatly more capable of supporting both respiration and combustion than atmospherical air, were collected in the bell-glass.

A part of this air being put into a glass tube of about an inch diameter, showed the following properties: A taper burned in it with a dazzling splendor, and charcoal, instead of consuming quietly as it does in common air, burnt with a flame, attended with a decrepitating noise, like phosphorus, and threw out such a brilliant light that the eyes could hardly endure it. This species of air was discovered almost at the same time by Mr. Priestley, Mr. Scheele, and myself. Mr. Pristley gave it the name of *dephlogisticated air.* Mr. Scheele called it *empyreal air.* At first I named it *highly respirable air,* to which has since been substituted the term of *vital air.* We shall presently see what we ought to think of these denominations.

In reflecting upon the circumstances of this experiment, we readily perceive, that the mercury, during its calcination, absorbs the salubrious and respirable part of the air, or, to speak more strictly, the base of this respirable part; that the remaining air is a species of mephitis, incapable of supporting combustion or respiration; and consequently that atmospheric air is composed of two elastic fluids of different and opposite qualities. As a proof of this important truth, if we recombine these two elastic fluids, which we have separately obtained in the above experiment, viz. the 42 cubical inches of mephitis, with the 8 cubical inches of respirable air, we reproduce an air precisely similar to that of the atmosphere, and possessing nearly the same power of supporting combustion and respiration, and of contributing to the calcination of metals.

Antoine Laurent Lavoisier, born August 26, 1743, guillotined during the French Revolution, May 8, 1794, performed his greatest service to chemistry by accurate weighing of all the substances in his experiments. He helped revise chemical nomenclature to express the exact composition of the substances named. His experiments upon the constitution of air, here reprinted, illustrate the principle upon which he insisted that both analysis and synthesis are necessary to the proof of a chemical theory. So exact was Lavoisier's work upon the constitution of air that he appears actually to have discovered, but misinterpreted, the residue of rare gases left with nitrogen after the removal of oxygen.

Mme. Lavoisier helped in the writing of his books, drew and engraved the plates for the illustrations, and edited his works after his death. In 1805 she married Count Rumford, the American-born British scientist, but they did not get along well together, and finally separated.

Science News-Letter, September 24, 1927

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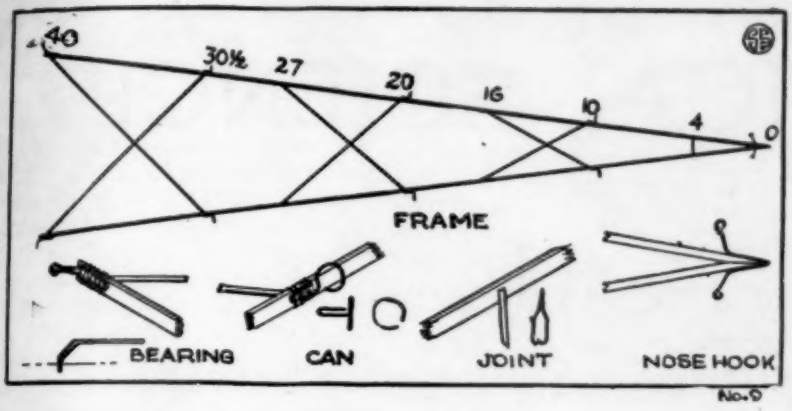

This is the sixth of a series of articles by Paul Edward Garber, telling how to make model airplanes. This article begins the description of a second and improved type of plane. Mr. Garber is in charge of aeronautics as the Smithsonian Institution.

By Paul Edward Garber

An Improved Scientific Model

The first five articles of this series told how to build a type of model which was designed primarily for ease in construction, although it also embodies good flying qualities. Having completed that model, the SS-1, and thus learned the elements of model aircraft construction, the model maker will be anxious to make a model with greater capabilities.

In making this second model, which we will call the "SS-2," greater care will be necessary in cutting and fitting the parts, and each completed unit must embody the utmost strength and yet be as light as possible. Practically every unit in this new model will be made to improved standards, involving the latest discoveries and inventions of the successful model flyer.

The wood to be used is known as balsa wood. This has only been available to model flyers in recent years, and immediately upon its adoption, model records leaped to previously unattainable marks. Balsa wood grows in Central America, where it derives its name from the Spanish word for "raft," as logs of this material are used for that purpose. Physically it is lighter than cork, and about half as strong as spruce. Its strength may be increased by coating it with banana oil after finished to size. It is obtained from model supply houses, a number of which are advertised in boys' magazines and aircraft periodicals.

The wire used for the fittings is known as piano wire. It is very hard and stiff, and ideal for model aircraft. In cutting it a good pair of hardened cutters must be used, and in bending it a good grip must be obtained. The propellers on this model are more efficient than those on the SS-1, and must be carved carefully, and balanced accurately. They also are made of balsa.

The fabric used will be light paper, preferably that known as Japanese silk tissue, which is extremely light but quite tough. It is important when covering the model surfaces, to keep every surface taut and smooth, retaining the proper shape and section of the wing, in order to derive every aerodynamical advantage.

If properly constructed of specified materials, the SS-2 will fly over half a mile and stay up as long as two minutes or even longer. The writer has often seen models of this type execute such flights, and knows that wonderful results will reward earnest efforts.

Constructing Frame of SS-2

It is essential that the frame of model airplane SS-2 be made true and strong. To accomplish this make a full size drawing of the plan view shown in the drawing, and use this to lay out the parts upon and mark their length and joints. The figures at the top indicate the number of inches each object is distant from the nose. If this method is not followed the resulting model will be very probably untrue, and not fit for flight. This model is made with a very slight margin of strength so every feature must be exact to prevent failure. Having completed the full-size drawing, procure the following material:

2 strips balsa wood 5/16" x 3/32" x 40".

1 piece bamboo pole, at least 14 inches long.

2 nails, or light brads, No. 15-1, ¼" long.

2½ inches No. 15 piano wire.

13½ inches No. 10 piano wire.

Thread, Ambroid.

Sandpaper the long balsa strips smooth and slightly round their edges. Cut the end of each to a wedge as shown in the detail drawing, and fasten them together with Ambroid. Form No. 15 wire into a nose hook of the type shown. The included angle of the nose hook should pinch very slightly onto the nose of the frame, after which it is bound and Ambroided in place. From the bamboo split six lengths, and trim these to a section of 3/32 inch x 1/32 inch. Lay these over the full size drawing and cut them to the proper length of the braces, making the front brace from a scrap of the shorter X-braces. When all are cut to length, sharpen the ends of each brace to a chisel-like point, as shown in the detail drawing, and beginning at the nose, work backward, putting each brace in place by carefully pushing it into the middle of the longerons at the proper point, and Ambroiding it in place. When all are in place take up the frame and sight along its sides to determine if it be true and flat sided. If not make it so by further inserting or slightly withdrawing the braces. This is a ticklish job but must be done right. When all is true, Ambroid any points which seem loose and bind and Ambroid the center crossing point of each X-brace.

Take the two nails and, by laying the heads on a piece of iron, and beating with a hammer, make a shovel-like end. In the center of this drill a hole with a No. 50 drill, which is slightly smaller than 1/16 inch. Slightly flatten the shank, and bend it twice as shown in the detail drawing. File or cut the point off square, and bind each nail bearing to the open end of frame as shown. Use Ambroid here. From the No. 10 wire cut six pieces, each 2¼ inches long, and form these into cans, or rubber loops, of the shape shown. Bind and Ambroid these in position. As seen one is placed in front of each X-brace. All of the open ends of the loops should be on one side of the frame.

When all joints are dry, trim off any projecting ends of braces which protrude through the sides, and give the frame a coat of banana oil which will strengthen it. If this application raises any roughness, sandpaper the frame lightly. When completed hang it up or lay it away carefully.

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EUGENICS

Danger In Race Mixture

Fast modern transportation, that has carried civilized peoples into the remote corners of the earth, is bringing about problems of race mixture such as have never existed before in the history of mankind. The potential dangers of European stock settling among primitive races were pointed out by Dr. Chas. B. Davenport of the Genetics Laboratory of the Carnegie Institution of Washington, at the International Congress of Anthropologists which met in Berlin recently.

It is not strange, Dr. Davenport declared, that statesmen, biologists and eugenists are asking what the consequences of such race crossing is likely to be. The question is raised whether it should be welcomed as tending to produce higher types or whether steps should be taken to prevent immigration to any country as a menace to its culture.

Each race that has persisted a long time in a distinct environment, the eugenics authority explained, has certain adaptations to that environment. In the mixture of races now taking place there are combinations of conditions which sometimes lead to disharmony from the conflict of developmental tendencies.

"Thus," he continued, "in America we have a union of races, characterized by large teeth in large jaws, with others having small teeth in small jaws. It has been suggested by orthodontists, specialists who correct irregular teeth, that a combination of an hereditary tendency to large teeth, combined with hereditary small jaws produces the crowding of teeth which has made orthodontia so important a

(*Just turn the page*)

PSYCHOLOGY

Mouth Tells More Than Eyes

Is your mouth the most expressive feature in your face? Evidence produced by experiments in the psychological laboratory at the Johns Hopkins University indicates that this may be true, and that the expressiveness of "soulful" or "dancing" eyes has been greatly overestimated by poets, novelists and lovers.

To test out the comparative expressiveness of the eyes and mouth, a number of photographs were taken of faces showing amusement, disgust, strain, pleasure, pain, and other states of feeling, says Dr. Knight Dunlap, in reporting the first of the experiments.

Copies of these pictures were cut in half, so that the lower part of the

(*Just turn the page*)

ZOOLOGY

You Dance?

Paul Whiteman, rumor tells us,
Was trying to invent
A trying kind of music
With a very modern bent.

He listened to the bugs and frogs
Without the least success;
And when he studied Beethoven,
His gain was even less.

He read in Science Service
The fact someone affirms,
About the choral aptitude
Of common angle worms.

"I got it!" quoth Paul Whiteman;
And thus each night was found,
Out in the apple orchard,
His ear upon the ground.

Now human dancers gyrate
And do estatic squirms
To the hideous cacophony
Of syncopating worms.

—Richard Ashman.

Science News-Letter, September 24, 1927

SOCIOLOGY

Phi Beta Kappa Girls Marry

The theory that the dumb Dora is the most successful husband snatcher and that the female Phi Beta Kappa is necessarily an unloved blue stocking is an example of another fallacy gone smash on the rocks of scientific investigation.

Drs. J. S. Bolin and S. J. Holmes have examined the records of 2074 alumnae of the University of California graduated between the years of 1874 and 1910 to see whether the dumbest or the brightest totaled the greater number of matrimonial hits. They state that of these, 1160 were married and 914 were unmarried, this proportion being roughly the same as that known to obtain in several other colleges and universities.

Investigation of the scholarship records showed that contrary to general expectation the grades of the married ranged a shade higher, .008 of a point to be exact, than those of their still unmated sisters. The girls who made the honorary society Phi Beta Kappa, awarded to students of high scholarship, were divided about fifty-fifty among the ranks of the married and the single.

Science News-Letter, September 24, 1927

At a height of a mile and a half in the air the coolest time of the 24 hours is in the day, rather than at night.

ZOOLOGY

Red Wolves On Rampage

The red wolf of Texas, despoiler extraordinary of sheep, goats and poultry, has caused so many thousands of dollars worth of damage during the past eight months, that government wolf experts are conducting a ruthless warfare against him.

Central Texas counties in particular are bending their efforts towards quick elimination of the pest. In Parker County alone, it is estimated that annually the red wolf destroys from $25,000 to $35,000 worth of animals. The Chamber of Commerce has found it necessary to put up dollar for dollar with the people in the rural districts, employing two government hunters, who, in the eight month period, managed to kill more than a hundred wolves.

Like his cousin, the notorious gray wolf of the western plains, expert killer of calves, which has been virtually stamped out in the west, the red wolf is primarily a lone despoiler. His habit is to venture forth at night, sweeping down upon farm and ranch, killing his prey and then hastening to his out-of-the-way retreat to sleep away his food debauch.

The Texas red wolf ranges in weight from 30 to 60 pounds, while the gray wolf, known in Texas as the lobo or timber wolf, ranges between 75 and 100 pounds. However, large

(*Just turn the page*)

CHEMISTRY

Germs Succumb to Perfume

Quotation from THE MYSTERY AND LURE OF PERFUME—C. J. S. Thompson—Lippincott.

Some years ago attention was called to a statement that cases of tuberculosis were much less common in the flower-growing districts of France than in other parts of the country. This was attributed to the antiseptic effects of the essential oils of the plants in general. It was also noted, that in the laboratories where the oils from the flowers were prepared, the majority of the workers remained remarkably free from diseases of the respiratory organs, which was also said to be due to the air being impregnated with the odors from the various essential oils.

The matter was then carefully investigated by Chamberland of the Institut Pasteur in Paris, and by Cadeac, Meunier, and Smetchensko. The results of their experiments were communicated to the French Biological Society by Charrin, who supported their conclusions. They may be summarized as follows: they found that the micro-organisms of

(*Just turn the page*)

Red Wolves on Rampage

(*Continued from page* 205)

individuals have been caught, according to C. R. Landon, leader of government predatory animal control in the Lone Star State. Some time ago, one of his men caught a giant red wolf weighing 63 pounds, near Llano. While the gray wolf has a very wide range in North America, the red wolf is a species of limited habitat, being found only in Texas and adjoining states of the Southwest.

The state of Texas has no red wolf bounty at the present time. The authorities learned a lesson from experiences of other western states in trying to eliminate the gray wolf. They discovered that while the bounty method had obvious advantages, there was a tendency for certain unscrupulous hunters to bring animals across the state borders. Another unfair and harmful practice of the "bounty wolfers" was to permit the females to live, with the result that often in the long run, far from being eliminated in a given state, the wolves increased in number.

In certain instances, however, private bounties have been created, a flat rate per head being offered by some clubs and individuals. In a number of neighborhoods, scattered individual despoilers have been doing so much damage that bounties as high as $150 to $300 are being offered.

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Germs Succumb to Perfume

(*Continued from page* 205)

glanders and yellow fever were easily killed by essential oils, the most effective being cinnamon, thyme, French geranium, Indian verbena, lavendar, patchouli, angelica, juniper, sandal, and cedar.

In a further test of the action of the oils upon organisms usually encountered in the air, on walls, or in the human body, certain bacteria were exposed to the emanations from essential oils for various periods. The results went to prove that many of the bacteria were killed in less than an hour by the evaporation of certain oils, and in some cases after only a few minutes. Arranged in the order of their bactericidal properties, these essential oils are as follows: Cinnamon, cloves, verbena, lavendar, patchouli, angelica, juniper, sandal, cedar, thyme, lemon, pine, wormwood, and extracts of jasmine and tuberose.

Science News-Letter, September 24, 1927

Spiders are fond of eating butterfly eggs.

"Morecroft" in a New Edition

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By John H. Morecroft, E. E., Past President, Institute of Radio Engineers

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Danger in Race Mixture

(*Continued from page* 205)

branch of medicine in the United States. Such crowded jaws are in striking contrast with the uniform dental arcades that one sees in comparatively unmixed, primitive peoples.

"Mental and temperamental incompatibilities may also arise, as we see in the mulattoes of North America which combine something of a white man's intelligence and ambition with an insufficient intelligence to realize that ambition. This leads in the hybrid to dissatisfaction and a feeling that he is not getting a fair deal."

The mixed progeny of the Chinese and the Hawaiians in the Hawaiian Islands stand first among all hybrids in industry and self support, in Dr. Davenport's estimation. They have the intelligence of the Chinese with the well-stabilized docile anad patient temperament of the Polynesian. Another comparatively successful cross is among the Dutch settlers and the natives of Java and Sumatra. These hybrids are often possessed of great physical beauty and high intelligence.

It is difficult to arrive at a dispassionate scientific analysis of the consequences of human hybridity, Dr. Davenport stated, because the subject is one that arouses emotional bias. The result of race crossing, he affirmed, depends on the particular nature of the cross.

"In the absence of any uniform rule as to consequences of race crossing it is well to discourage it, except in those cases where, as in the Hawaiian-Chinese cross, it clearly produces superior progeny. The negro-white and Filipino-European crosses seem, on the whole, socially inferior to the parent races."

Science News-Letter, September 24, 1927

Mouth Tells More Than Eyes

(*Continued from page* 205)

nose and the mouth of one face could be fitted to the upper part of the nose and the eyes of another face. Students were then asked to label the emotion expressed by the composite faces.

"The pleased characteristic in facial expression is given almost solely, if not entirely, by the pattern of the mouth muscles," Dr. Dunlap concludes. "The apparently pleased, happy, or mirthful expression of the eyes when conjoined to the mouth which really expresses pleased feeling, changes immediately into unpleasant expression, when conjoined with an unpleasant mouth. In the total facial pattern, it is the mouth that is important, not the eyes."

Science News-Letter, September 24, 1927

First Glances at New Books

SEASHORE ANIMALS OF THE PACIFIC COAST—Myrtle E. Johnson and Harry J. Snook—*Macmillan* ($7.50). For years students, teachers and the army of informal nature-observers wandering on the seashore in the Pacific Coast states have very acutely felt the lack of a good and really complete book that would describe and picture the things they see among the rocks and on the sand. That long want is now filled and more than filled, for the authors of the present volume leave little to be said, short of the heavy monographs of the professional library. They describe well, and illustrate even better. The 658 pages of the book contain an even 700 figures, many of them most beautifully done in colors. The appropriateness of the dedication to Dr. William E. Ritter will need no explanation to any one who has ever had to do with Pacific Coast marine zoology.

Science News-Letter, September 24, 1927

THE NATURE OF THE WORLD AND OF MAN—Edited by H. H. Newman —*Univ. of Chicago Press* ($5). A revised edition within a year from first publication is an indication that a book is either very bad or very good. In this case the revision is needed because the book is very good and has already proved so serviceable in giving a clear and competent statement of the present knowledge in the sciences. The editors promise frequent revisions in the future whenever needed to keep up with the rapid advance of science.

Science News-Letter, September 24, 1927

THE EARLY HISTORY OF MAN—Henry Field—*Field Museum of Natural History* (25c). A well gotten up, beautifully illustrated popular pamphlet on the always fascinating subject of paleolithic man and his art.

Science News-Letter, September 24, 1927

THE ADVANCEMENT OF SCIENCE, 1927—*British Association for Advancement of Science, London* (6s.). This annual volume contains the presidential addresses delivered before the recent meeting at Leeds. It is therefore a review of the present state of science.

Science News-Letter, September 24, 1927

MAN AND WOMAN—Havelock Ellis—*Black, London* (10s. 6d.). The sixth edition of a well-known study of the ways in which men and women differ.

Science News-Letter, September 24, 1927

ARCHÆOLOGY

Largest Petroglyph

What is described as the largest specimen of petroglyph, or Indian rock carving, in Canada has just been reported to the Archæological Office of the Canadian National Museum. This carving is said to be 250 feet long and is located near Yale, B. C.

According to the reports, it is carved on a vertical face of reddish rock, sheltered by an overhanging ledge. It is about half a mile south of the eastern end of the Alexander Bridge on the Caribou Highway, and near the Canadian National Railway. A trout fishing trail from which it can probably be seen runs up in its direction.

Previously, the largest known rock carving was located on the west side of a seventy-foot canyon about one mile south of Mackenzie Highway, in the "Norway of Canada" near Bella Coola, B. C. If the 250-foot carving is verified, efforts will probably be made to have the region set aside as a national monument.

Science News-Letter, September 24, 1927

METEOROLOGY

Winds Not Prophetic

If the old idea that the severity of a winter can be forecast by the direction of the winds at the autumnal equinox was ever true any place, it has certainly not been exemplified in Philadelphia in the last twenty years. This is shown by a study made by George S. Bliss, in charge of the Philadelphia Weather Bureau.

Mr. Bliss has consulted his records to find which way the wind was blowing at the exact moment that the sun was at the autumnal equinox, or directly over the equator, since 1907.

The coldest winter which Philadelphia experienced was that of 1917, when the mean temperature was 32.5 degrees Fahrenheit, and 36.9 inches of snow fell. This was preceded by northeast wind at the equinox. But the warmest winter, that of 1920, with a mean temperature of 41.5 degrees, and only 11.3 inches of snow, was also preceded by northeast winds at the equinox. The second warmest winter of the period, that in 1912, with 41.1 degrees and 9.2 inches of snow followed easterly equinoctial winds. So did the second coldest winter, that of 1911, which had a mean temperature of 34.3 degrees and 22.5 inches of snow.

The other winters of the period followed winds from various directions, scattered at random.

Science News-Letter, September 24, 1927

BIOLOGY

NATURE RAMBLINGS

By FRANK THONE

Wisent

We are much accustomed to speak of the American buffalo, or bison, in a lowered, sad tone of voice, with a shaking of the head as over a great tragedy. Tragic their fate has been, to be sure, but it is as nothing compared with that of their almost unknown, and now almost extinct, European kindred animal, the wisent.

According to Dr. Theodor Ahrens, well-known German naturalist, there were, before the war, some 1650 specimens of this great beast left in existence. Of these about 800 were on a preserve in Lithuania, belonging to the Czar. About 700 more were in the Kuban region of the Caucasus, property of the Russian Crown. There was a smaller herd of about 70 in upper Silesia, then Prussian, and a scattering of some 75 more in zoological gardens and private estates.

At the end of the war, in 1918, the Lithuanian herd had ceased to exist. Of the Caucasian herd, according to reports of the Soviet authorities, about 25 are left. The 70 in Silesia have been reduced to three. It is doubtful whether as many as 100 still live.

Lately a movement has been started throughout northern and western Europe to save the remnant of this once widespread species. The last census available lists 69 specimens definitely known to be in existence. Of these 33 were cows. Some of the breeding stock has had to be excluded from the register, however, because it has been discovered that they have some hybrid blood in them. Efforts are being made to reproduce the pure-blooded stock as rapidly as good management will permit, and the calves are given the most scrupulous care.

The situation is unquestionably serious; but when it is remembered that the Yellowstone Park herd of bison started a generation ago with less than 30 animals and now has a count of over 800, there is reason to hope that this ancient and interesting species may be saved from extinction.

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